11447

INSTRUCTIONS

for the

MODEL 980 ANALYZER

WESTON

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INSTRUCTIONS

FOR THE

WESTON MODEL 980 ANALYZER

(PATENTS PENDING)

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by

WESTON INSTRUMENTS, DIVISION OF DAYSTROM, INCORPORATED

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Figure 1. Model 980 Analyzer and Accessories

GENERAL DESCRIPTION

GENERAL: The Model 980 is a compact ultra-sensitive, completely self-contained analyzer, utilizing the latest technological advances in its design and construction. Precision deposited carbon resistors and wire-wound resistors of ±1% tolerance are used throughout for maximum accuracy. A single knob and two pin jacks handle all ranges except for the highest AC-DC voltage range and highest current range which are brought out to separate pin jacks. (See Figure 1, Page 3)

A large 5 inch meter with a scale length of more than 4½ inches provides easy readability and the ranges have been chosen to give maximum functional coverage of measurements made in the modern electronic industry. A separate scale has been provided for the 1.6 volt AC range, while all other AC and DC voltages and DC currents are read on the DC scale. The ohms scale, with 25 ohms center, is figured from 0 to 1000 and is carefully divided to give accurate readings. A full size scale is illustrated on page 20.

The two lower pin jacks marked V-Ω-MA and COMMON are used for all AC-DC volts, DC current and ohms, with the exception of 1600 volts AC and DC and 8 amps which are brought out to separate pin jacks.

BATTERY INSTALLATION: Remove the back case of the instrument and slip the 1.5 volt battery into the lower clip and the 15 volt battery into the higher clip observing the polarity as marked next to the clips.

RANGES: The Model 980 Analyzer has the following ranges:

DC Volts at 20,000 Ω/v	AC Volts at 1,000 Ω/v	DC Current	Db	Ohms Full Scale	Center Scale
1.6	1.6	80 μa	−15 to +6	1,000	25
8	8	8 ma	−1 to +20	10,000	250
40	40	80 ma	+13 to +34	100,000	2,500
160	160	800 ma	+25 to +46	1 meg	25,000
400	400	8 amps	+33 to +54	10 meg	250,000
1600	1600				

STEP-BY-STEP OPERATING INSTRUCTIONS

DC VOLTAGE MEASUREMENTS TO 400 V:

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in V-Ω-MA pin jack.
3. Rotate SWITCH to desired DC voltage range.

   Caution: If voltage to be measured is unknown, start at 400 v range and work down.
4. Read DC voltage on AC-DC arc.

Switch Setting	Scale Used
1.6 V	16÷10
8 V	8 full scale
40 V	40 full scale
160 V	16 x 10
400 V	40 x 10

DC VOLTAGE ABOVE 400 V:

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in 1600 VDC pin jack.
3. Rotate SWITCH to 160 VDC position.
4. Read DC voltage on AC-DC arc.

Switch Setting	Scale Used
160 VDC	16 x 100

AC VOLTAGE MEASUREMENTS TO 400 V:

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in V-Ω-MA pin jack.
3. Rotate SWITCH to desired AC voltage range.

   Caution: If voltage to be measured is unknown, start at 400 v range and work down.
4. Read AC voltage above 1.6 VAC on AC-DC arc.
   Read AC voltage less than 1.6 V on 1.6 VAC arc.

(Continued on the next page)

Switch Setting	Scale Used
1.6 V	1.6 VAC full scale
8 V	8 full scale
40 V	40 full scale
160 V	16 x 10
400 V	40 x 10

AC VOLTAGE ABOVE 400 V:

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in 1600 VAC pin jack.
3. Rotate SWITCH to 160 VAC position.
4. Read AC voltage on AC-DC arc.

Switch Setting	Scale Used
160 V	16 x 100

Note: If DC is present in the AC to be measured, an external blocking condenser of 0.5 mfd should be added in series with the red test lead.

DC CURRENT MEASUREMENTS TO 800 MA:

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in V-Ω-MA pin jack.
3. Rotate SWITCH to desired current range.

Caution: Always start with switch in 800 ma position and work down until the most accurate reading is obtained.

4. Read DC current on AC-DC arc.

Switch Setting	Scale Used
80 μa	8 x 10
8 ma	8 full scale
80 ma	8 x 10
800 ma	8 x 100

(Continued on the next page)

DC CURRENT MEASUREMENTS ABOVE 800 MA TO 8 AMPS:

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in 8 AMP pin jack.
3. Rotate SWITCH to 800 MA position.
4. Read DC current on AC-DC arc.

Switch Setting	Scale Used
800 ma and 8 amp jack	8 full scale

RESISTANCE MEASUREMENTS:

Caution: Make sure all voltage is turned off before connecting the instrument to the device being checked.

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in V-Ω-MA pin jack.
3. Rotate SWITCH to desired ohmmeter range.
4. Short TEST LEADS together and set POINTER to TOP SCALE position by rotating OHMMETER ADJUSTER.
5. Read resistance on the OHMS arc.

Switch Setting	Multiply Reading By
R x 1	1
R x 10	10
R x 100	100
R x 1000	1000
R x 10,000	10,000

(Continued on the next page)

DB MEASUREMENTS (—15 to +54 db):

Note: Zero power level is based on 1 milliwatt in a 600 ohm line.

1. Plug BLACK test lead in COMMON pin jack.
2. Plug RED test lead in V-Ω-MA pin jack.
3. Rotate SWITCH to desired range as listed in Step 4.
4. Read db on arc marked —15 to +6 db.

Switch Setting	db Range	Add to reading on —15 to +6 db arc
1.6	—15 to +6	use —15 to +6 arc
8	—1 to +20	+14
40	+13 to +34	+28
160	+25 to +46	+40
400	+33 to +54	+48

If reading is above +54 db, change red test lead to 1600 VAC pin jack and add +60 db to reading on —15 to +6 db arc.

Note: If DC is present in the AC to be measured, an external blocking condenser of 0.5 mfd should be added in series with the red test lead.

DATA ON DB LEVELS

Power Level DB	6 MW in 500 Ohms	Volts, based on O DB of 6 MW in 600 Ohms	1 MW in 600 Ohms
−10	0.548	0.600	0.245
− 9	0.614	0.673	0.275
− 8	0.689	0.755	0.308
− 7	0.774	0.847	0.346
− 6	0.868	0.951	0.388
− 5	0.974	1.067	0.436
− 4	1.093	1.197	0.489
− 3	1.226	1.343	0.548
− 2	1.376	1.507	0.615
− 1	1.544	1.691	0.690
0	1.732	1.897	0.775
+ 1	1.943	2.129	0.869
+ 2	2.180	2.389	0.975
+ 3	2.447	2.680	1.094
+ 4	2.745	3.007	1.228
+ 5	3.080	3.374	1.377
+ 6	3.456	3.787	1.545
+ 7	3.878	4.248	1.734
+ 8	4.351	4.766	1.946
+ 9	4.882	5.347	2.183
+10	5.477	6.000	2.449
+11	6.145	6.732	2.748
+12	6.895	7.554	3.084
+13	7.737	8.475	3.460
+14	8.681	9.509	3.882
+15	9.740	10.67	4.356
+16	10.93	11.97	4.887
+17	12.26	13.43	5.484
+18	13.76	15.07	6.153
+19	15.44	16.91	6.904

(Continued on the next page)

DATA ON DB LEVELS (Con't)

Power Level DB	6 MW in 500 Ohms	Volts, based on O DB of 6 MW in 600 Ohms	1 MW in 600 Ohms
+20	17.32	18.97	7.746
+21	19.43	21.29	8.691
+22	21.80	23.89	9.752
+23	24.47	26.80	10.94
+24	27.45	30.07	12.28
+25	30.80	33.74	13.77
+26	34.56	37.87	15.45
+27	38.78	42.48	17.34
+28	43.51	47.66	19.46
+29	48.82	53.48	21.83
+30	54.77	60.00	24.49
+31	61.45	67.32	27.48
+32	68.95	75.54	30.84
+33	77.37	84.75	34.60
+34	86.81	95.09	38.82
+35	97.40	106.70	43.56
+36	109.3	119.7	48.87
+37	122.6	134.3	54.84
+38	137.6	150.7	61.53
+39	154.4	169.1	69.04
+40	173.2	189.7	77.46
+41	194.3	212.9	86.91
+42	218.0	238.9	97.51
+43	244.7	268.0	109.4
+44	274.5	300.7	122.8
+45	308.0	337.4	137.7
+46	345.6	378.7	154.6
+47	387.8	424.8	173.4
+48	435.1	476.6	194.6
+49	488.2	534.7	218.3
+50	547.7	600.0	245.0

THEORY OF OPERATION

DC VOLTS: All DC voltage ranges operate with a sensitivity of 20,000 ohms per volt. The circuit operates as is shown in figure 2.

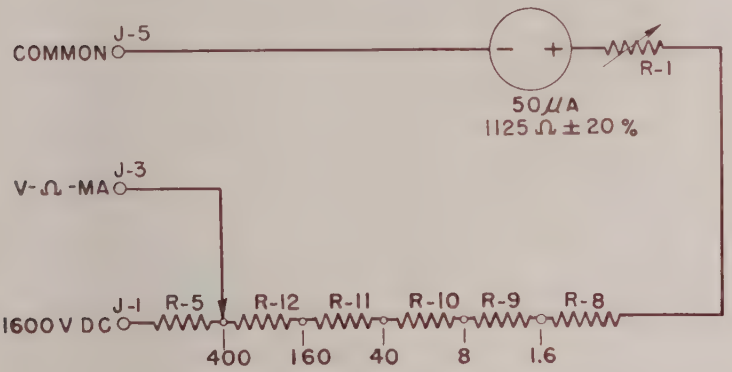

Figure 2. DC Volts Circuit

As the range is changed additional resistance is added in series to obtain the necessary full scale deflection. The following formula can be used to determine the total series resistance added to the meter for a given range. R = 20,000 x V —2000 where V = voltage range considered. For example, when the 1.6 volt range is selected we obtain R = 20,000 x 1.6 —2000 = 30,000 ohms. The amount of resistance added on any particular range is the difference between the total resistance of that range and the previous range.

AC VOLTS: All AC voltage ranges operate with a sensitivity of 1000 ohms per volt. The applied AC voltage is rectified by a two disc copper oxide rectifier. One disc passes current on the positive cycle, while the other disc passes current during the negative cycle. The resultant DC is read on the DC meter.

The rectifier section is factory adjusted to 1 milliampere AC using shunt resistor R—2. As the range is changed, additional series resistance is added ahead of the rectifier to obtain full scale deflection as in figure 3.

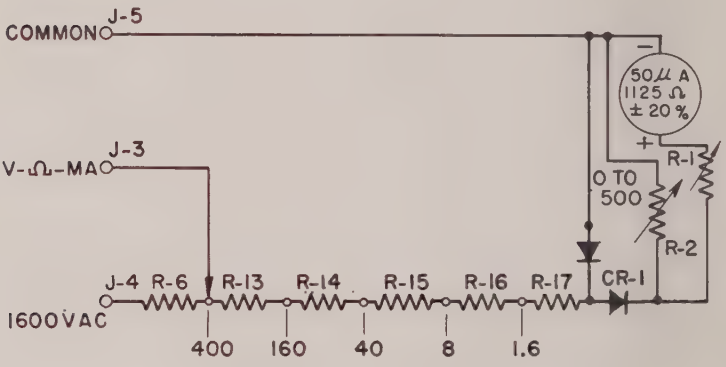

Figure 3. AC Volts Circuit

OHMMETER RANGES: The ohmmeter ranges are of the series type illustrated in figure 4. In the three lower ranges current flows from the 1.5 volt battery through one of the shunt resistors, according to the range selected, and then returns through the unknown resistor Rx being measured to the battery. The shunt resistor is paralleled by the meter circuit. In the two higher ranges the shunt resistors are eliminated and the current from the battery flows through either R-25 or R-24 according to the range selected, and then returns through the meter circuit and unknown resistor Rx to the battery. On the highest range more voltage is necessary, therefore, the 1.5 volt battery is replaced by a 15 volt battery. The ohmmeter adjuster and a series resistor are in shunt across the meter to compensate for changes in battery voltage.

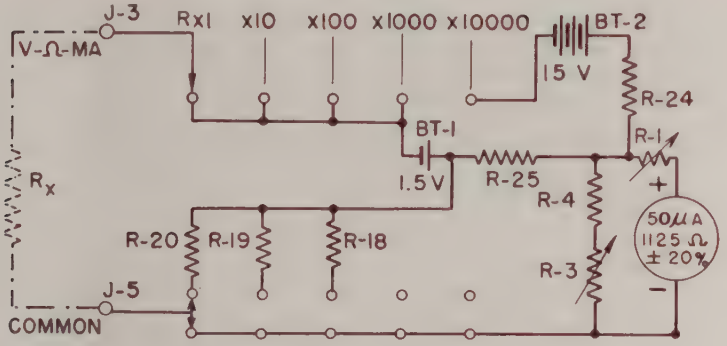

Figure 4. Ohmmeter Circuit

DB RANGES: The db ranges operate on the same principle as the AC voltage ranges with the exception that the readings are taken on a db arc. Zero power level is based on 1 milliwatt in a 600 ohm line.

DC MILLIAMPERE RANGES: The operation of the milliampere ranges is shown in figure 5, below. The meter sensitivity is varied by means of a series resistor and shunt resistor which

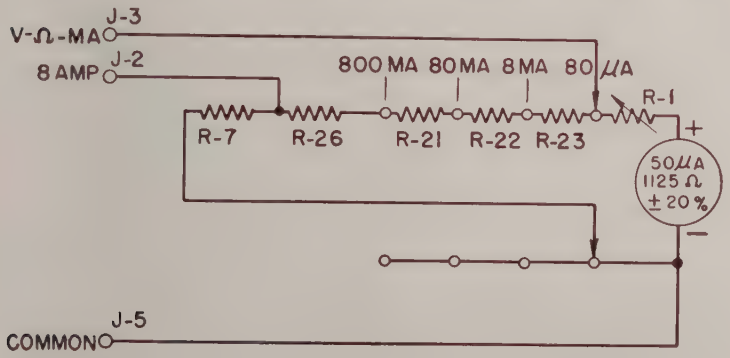

Figure 5. DC Milliamperes Circuit

change as different ranges are selected. The current divides inversely proportional to the total resistance in each branch of the parallel circuit, with the major portion flowing through the shunt resistor. The total ring shunt resistance remains constant, but as the range is changed, more or less of the shunt is placed in series with the meter which either increases or decreases the value of the shunt resistor, thus changing the meter sensitivity.

MAINTENANCE

REPLACEMENT OF BATTERIES: The analyzer has two batteries, a 1.5 volt battery for the four lower ohmmeter ranges and a 15 volt battery for the highest ohmmeter range. When the instrument can no longer reach full scale deflection on any of the four lower ohmmeter ranges when the leads are shorted and the ohmmeter control rotated, the 1.5 volt battery must be replaced. When the instrument can no longer reach full scale deflection on the R x 10,000 range when the leads are shorted and the ohmmeter control adjusted, the 15 volt battery must be replaced. To change either of the two batteries it is only necessary to remove the back of the instrument and slip out the old battery and place a fresh one it its place. (See Figure 6, Page 16)

Caution: When replacing batteries, always observe the polarity which is marked in the bottom of the case. Failure to do so will cause a downscale deflection on the meter.

SWITCH ROTOR: This instrument uses a molded plastic switch rotor to which are attached the contact fingers. Under normal use this rotor should last the lifetime of the instrument. If for some reason the rotor or switch contacts should become damaged, the entire rotor may easily be replaced. To do this it is first necessary to remove the etched plate by unscrewing the two brass studs with the hexagonal heads, and then remove the two screws near the bottom of the plate. The white and black meter leads are unsoldered and then the plate may be lifted out. The switch rotor is removed by slipping the push-on clip off the protruding shaft and replacing the damaged rotor with a new one.

Caution: Before installing the new rotor, clean the switch section of the etched plate using NO-NOISE lubricant and a piece of cloth, and then put a heavy layer of the NO-NOISE over the switch pattern. ALLOW 10 MINUTES FOR SOLVENT IN NO-NOISE LUBRICANT TO EVAPORATE BEFORE ATTACHING ROTOR. BE SURE THAT NO-NOISE LUBRICANT DOES NOT TOUCH ROTOR. DO NOT SPRAY NO-NOISE LUBRICANT ON SWITCH PATTERN WHILE ROTOR IS ATTACHED.

Caution: Ten minutes must elapse before assembling the switch hub to the etched circuit plate, to allow the solvent in the NO-NOISE lubricant to evaporate. Failure to do so will cause the contact fingers to come off the switch hub.

Caution: Before replacing the etched plate index the switch knob to the R x 10,000 position and rotate the rotor until the small hole in it lines up with the small silver dot on the etched plate.

CLEANING PROCEDURE FOR METER WINDOW: If the window needs cleaning, it should be done with absorbent cotton dipped in a solution made by dissolving ½ teaspoon of detergent, such as Vel or Dreft, in one gallon of water. Allow this solution to air dry and do not rinse with clear water.

COMPONENTS:

1. The components used in this instrument are either ±1% deposited carbon precision resistors or ±1% wire-wound resistors. If for any reason a component becomes damaged it may easily be replaced by clipping off the damaged component in such a manner as to leave the leads protruding up above the plate. When this is done the replacement component may be soldered directly to these leads, thus eliminating the necessity of removing the plate from the instrument.
2. Fuse—An 8 amp fuse is provided in this instrument to protect the etched circuit from severe overloads. If the fuse is blown it may be replaced readily by either soldering a new one across the old one or by using a commercially available fuse clip such as is used in replacing television set fuses.

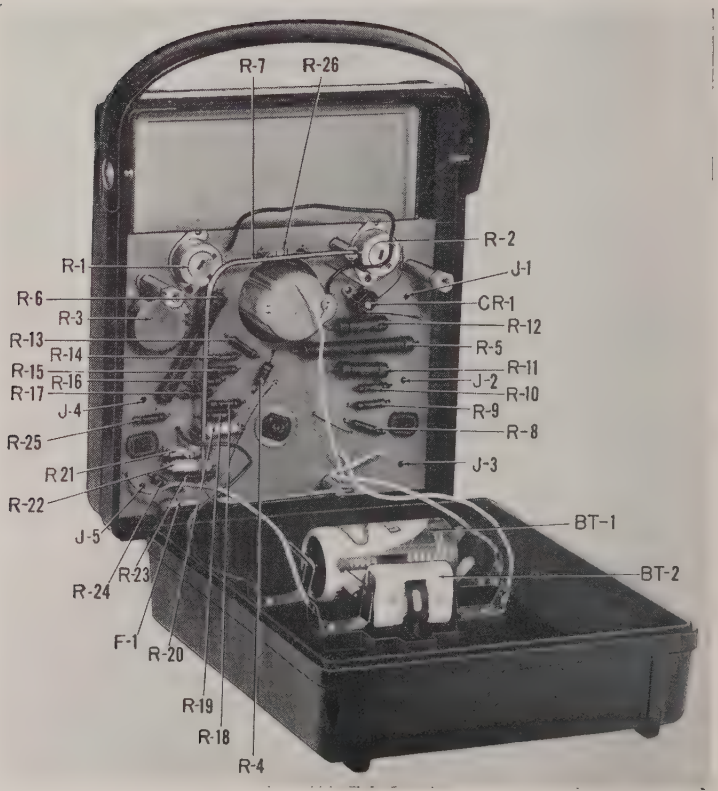

Figure 6. Internal View—Model 980

REPLACEMENT PARTS LIST FOR MODEL 980

Circuit Symbol	Description	Weston Part No.
E-1	KNOB: black bakelite; push-on-type; for ¼ in. shaft 1 5/16 in. dia; 1⅝ in. high.	ND-27780
E-2	KNOB: black bakelite; ⅝ in. dia; 7/16 in. high w/no. 8-32 Allen recess set-screw; for ¼ in. shaft.	ND-27781
F-1	FUSE: 8 amp; Littlefuse 3 AG; catalog no. 312008.	Ref. only
J-1 to J-5	CONNECTOR, RECEPTICLE: female; solder lug terminal; bent on bottom end and soldered to etched circuit panel.	150555
R-1	RESISTOR, VARIABLE: wire-wound; 1,500 ohms; ±20%.	150579
R-2	RESISTOR, VARIABLE: wire-wound; 300 ohms; ±20%.	162292
R-3	RESISTOR, VARIABLE: carbon; 25,000 ohms; ±20%.	150580
R-4	RESISTOR, FIXED, COMPOSITION: carbon; 4,700 ohms; ±10%; ½ watt.	ND-27605
R-5	RESISTOR, FIXED, DEPOSITED CARBON: 24 megohms; ±1%; 2 watts.	ND-27695
R-6	RESISTOR, FIXED, DEPOSITED CARBON: 1.2 megohms; ±1%; 2 watts.	ND-27692
R-7	SHUNT, INSTRUMENT: (8 amp range); 0.0333 ohms.	150553
R-8	RESISTOR, FIXED, DEPOSITED CARBON: 30,000 ohms; ±1%; ½ watt.	ND-27685
R-9	RESISTOR, FIXED, DEPOSITED CARBON: 128,000 ohms; ±1%; ½ watt.	ND-27688
R-10	RESISTOR, FIXED, DEPOSITED CARBON: 640,000 ohms; ±1%; ½ watt.	ND-27691
R-11	RESISTOR, FIXED, DEPOSITED CARBON: 2.4 megohms; ±1%; 1 watt.	ND-27693
R-12	RESISTOR, FIXED, DEPOSITED CARBON: 4.8 megohms; ±1%; 1 watt.	ND-27694
R-13	RESISTOR, FIXED, DEPOSITED CARBON: 240,000 ohms; ±1%; ½ watt.	ND-27689

(Continued on the next page)

REPLACEMENT PARTS LIST FOR MODEL 980 (Con't)

Circuit Symbol	Description	Weston Part No.
R-14	RESISTOR, FIXED, DEPOSITED CARBON: 120,000 ohms; ±1%; ½ watt.	ND-27687
R-15	RESISTOR, FIXED, DEPOSITED CARBON: 32,000 ohms; ±1%; ½ watt.	ND-27686
R-16	RESISTOR, FIXED, DEPOSITED CARBON: 6,470 ohms; ±1%; ½ watt.	ND-27683
R-17	RESISTOR, FIXED, DEPOSITED CARBON: 1,160 ohms; ±1%; ½ watt.	ND-27681
R-18	RESISTOR, FIXED, DEPOSITED CARBON: 2,790 ohms; ±1%; ½ watt.	ND-27682
R-19	RESISTOR, FIXED, DEPOSITED CARBON: 252 ohms; ±1%; ½ watt.	ND-27680
R-20	RESISTOR, FIXED, WIRE-WOUND: 24.6 ohms; ±1%.	150550
R-21	RESISTOR, FIXED, WIRE-WOUND: 3 ohms; ±1%.	150549
R-22	RESISTOR, FIXED, WIRE-WOUND; 30 ohms; ±1%.	150551
R-23	RESISTOR, FIXED, DEPOSITED CARBON: 3,300 ohms; ±1%; ½ watt.	ND-27755
R-24	RESISTOR, FIXED, DEPOSITED CARBON: 250,000 ohms; ±1%; ½ watt.	ND-27690
R-25	RESISTOR, FIXED, DEPOSITED CARBON: 23,300 ohms; ±1%; ½ watt.	ND-27684
R-26	RESISTOR, FIXED, WIRE-WOUND: 0.3 ohms; ±1%.	150548
S-1	ROTOR ASSEMBLY: switch.	150539
W-1	LEAD, TEST: assembled; red cable.	150574
W-2	LEAD, TEST: assembled; black cable.	150575
BT-1	BATTERY: 1½ volt; Ray-O-Vac no. 2 LP size "D" leakproof.	Ref. only
BT-2	BATTERY: 15 volt; Everyready no. 411.	Ref. only
CR-1	RECTIFIER: copper oxide; 130 mil disc; pink dot.	89852

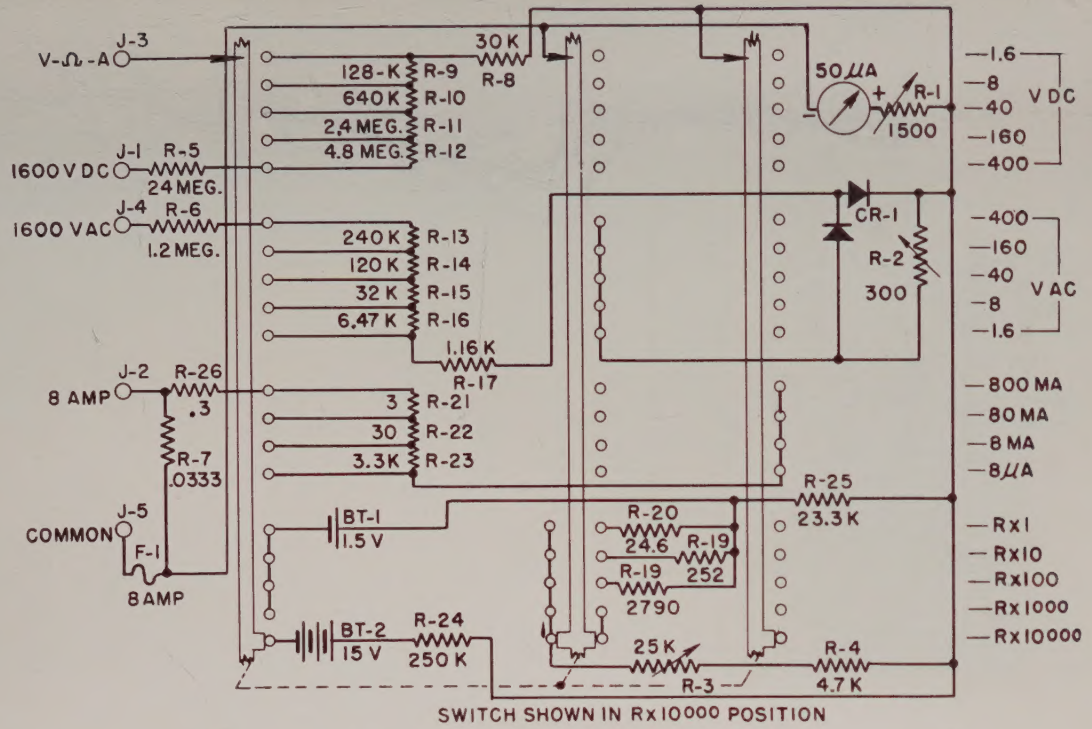

Figure 7. Schematic Diagram—Model 980

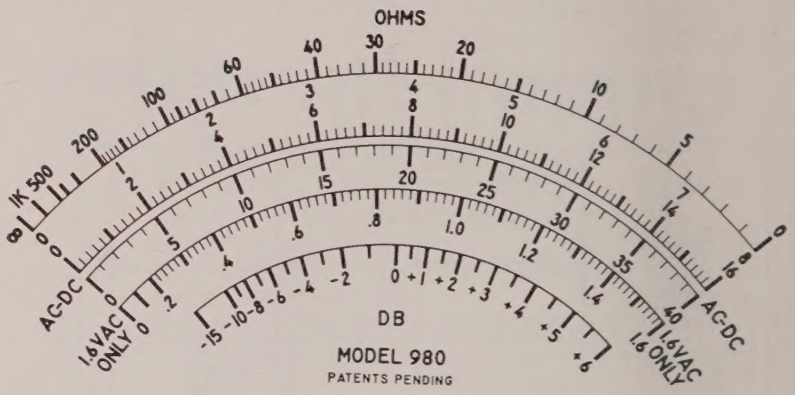

Figure 8. Full Size Scale—Model 980

THE WESTON 980 LINE

MODEL 980 ANALYZER

MODEL 981 TUBECHECKER

MODEL 982 VACUUM TUBE VOLTMETER

MODEL 983 OSCILLOSCOPE

MODEL 984 SWEEP GENERATOR

MODEL 985 CALIBRATOR

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